Before the FEDERAL COMMUNICATIONS COMMISSION Washington, DC 20554

In the Matter of)	
)	
Expanding the Economic and Innovation)	WT Docket No. 12-268
Opportunities of Spectrum Through Incentive)	
Auctions)	

REPLY COMMENTS OF T-MOBILE USA, INC.

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I. INTRODUCTION AND SUMMARY

T-Mobile USA, Inc. ("T-Mobile") submits these reply comments in response to the *Public Notice* issued by the Federal Communications Commission ("FCC" or the "Commission") in this proceeding. By seeking comment regarding how various band plans accommodate market-by-market variation in the amount of spectrum cleared, the Commission elicited several valuable points of consensus. Many commenters agreed, for example, that the Commission's proposed Down from 51 Reversed plan sacrifices too much valuable paired broadband spectrum for guard band use and should not be adopted.

A number of commenters also agreed with T-Mobile that interference concerns associated with market-by-market variation in the amount of spectrum cleared for broadband use appear to be manageable. For those markets where the reverse auction clears less than the 84 MHz of spectrum between Channels 37 and 52, the record generally shows that wireless operators do not believe that co-channel interference from broadcasters located in a

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¹ Wireless Telecommunications Bureau Seeks to Supplement the Record on the 600 MHz Band Plan, Public Notice, GN Docket No. 12-268 (May 17, 2013) ("Public Notice").

geographically adjacent market will pose an insurmountable challenge to widespread, costeffective wireless broadband deployment in the 600 MHz band.² Likewise, commenters, such as
Verizon and CTIA—The Wireless Association, agree that a Down from 51 FDD plan that
accommodates remaining broadcast stations in a portion of the uplink spectrum offers a superior
alternative to a lowest-common-denominator approach where the Commission auctions only a
limited amount of paired 600 MHz spectrum for broadband use even in those markets where few,
if any, broadcast stations remain.³ This view is especially persuasive if positioning television
operations in the uplink spectrum remains the exception and not the rule, which T-Mobile
believes will be the case.

In addition, a majority of commenters support a Down from 51 FDD plan.⁴ Although some commenters support a TDD plan,⁵ a Down from 51 FDD plan creates fewer interference concerns. TDD, for example, requires a substantial guard band between the 600 and 700 MHz bands. TDD also creates the need for all competitors in a market to both synchronize their

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² Comments of AT&T Inc., GN Docket No. 12-268 at 4-5 (June 14, 2013) ("AT&T Comments"); Comments of T-Mobile, GN Docket No. 12-268 at 17 n.32 (June 14, 2013); Verizon and Verizon Wireless Comments, GN Docket No. 12-268 at 8-9 (June 14, 2013) ("Verizon Comments").

³ See Verizon Comments at 7, Exhibit A; Comments of CTIA—The Wireless Association®, GN Docket No. 12-268, at 15 (June 14, 2013) ("CTIA Comments").

⁴ AT&T Comments at 7; Comments of CIT Group Inc., GN Docket No. 12-268, at 3 (June 14, 2013); Comments of Consumer Electronics Association, GN Docket No. 12-268, at 1 (June 14, 2013) ("Consumer Electronics Association Comments"); CTIA Comments at 6; Comments of GE Healthcare, GN Docket No. 12-268, at 6 (June 14, 2013) ("GE Healthcare Comment"); Comments of Mobile Future, GN Docket No. 12-268, at 4 (June 14, 2013) ("Mobile Future Comments"); Comments of Motorola Mobility LLC, GN Docket No. 12-268, at 1 (June 14, 2013) ("Motorola Mobility Comments"); Comments of National Cable & Telecommunications Association, GN Docket No. 12-268, at 8-9 (June 14, 2013) ("National Cable & Telecommunications Association Comments"); Comments of Qualcomm, Inc., GN Docket No. 12-268, at 3-4 (June 14, 2013) ("Qualcomm Comments"); RIM Comments at 1; Spectrum Management Consulting Comments at 10-11; Comments of Telecommunications Industry Association, GN Docket No. 12-268, at 5 (June 14, 2013); Comments of the WMTS Coalition, GN Docket No. 12-268, at 5 (June 14, 2013) ("WMTS Coalition Comments"); Verizon Comments at 2.

⁵ See Comments of Cellular South, Inc., GN Docket No. 12-268 at 2 (June 14, 2013) ("C Spire Comments"); Comments of Sprint Nextel Corporation, GN Docket No. 12-268 at 2 (June 14, 2013) ("Sprint Comments"); Comments of Clearwire Corporation, GN Docket No. 12-268 at 3 (June 14, 2013) ("Clearwire Comments"); Comments of Sinclair Broadcast Group, Inc., GN Docket No. 12-268 at 1 (June 14, 2013).

operations and use the same uplink/downlink ratios to avoid interfering with each other.

Synchronization will require either widespread industry collaboration on the one hand, or intrusive regulatory intervention to define common system operating parameters on the other, neither one of which is ideal in an actively competitive environment.

Finally, T-Mobile remains confident that at least 84 MHz of spectrum will be cleared in a substantial majority of markets, which would allow the substantial benefits of a 35 x 35 MHz Down From 51 Plan to be fully realized in those markets. However, if contrary to these expectations, substantially less than 84 MHz of spectrum is cleared in a majority of the country, the benefits of a 35x35 MHz Down from 51 plan become attenuated and this configuration may not prove optimal. To account for that possibility, the Commission could adopt a back-up, or "contingent," band plan optimized for achieving the band configuration best suited for low-spectrum clearing scenarios. A 35x35 MHz band plan, perhaps with some contingency allowing for another band plan arrangement in the event that substantially less spectrum is cleared in most markets, delivers the most spectrum for use in wireless broadband services, maximizes the benefits to consumers, and helps promote wireless competition.

II. COMMENTERS AGREED THAT THE DOWN FROM 51 REVERSED PLAN ALLOCATES SPECTRUM INEFFICIENTLY

Almost all commenters addressing the issue agreed with T-Mobile that the Down from 51 Reversed proposal introduces new inefficiencies not found in other band plan designs and, as a result, delivers too little spectrum for wireless broadband use. Commenters urged the Commission to pursue various alternative band plan designs, the most prominent of which was the Down from 51 plan that the Commission originally proposed.

Alcatel-Lucent, for example, explained that the "traditional Down from 51 plans are more

spectrally efficient." As CTIA noted, the Reversed Plan "requir[es] an additional guard band that would not be necessary under a traditional 'Down from 51' plan." Preemptively allocating spectrum as a guard band in a time of spectrum scarcity is "unwise" and unnecessary, other commenters noted. Regardless of the amount of spectrum cleared, therefore, most commenters indicated the additional guard band required in the Down from 51 Reversed band plan was inefficient and urged the Commission to reject this approach. 10

Placing downlink adjacent to uplink also raises interference concerns for lower 700 MHz license holders and prospective upper 600 MHz license holders. ¹¹ If the guard band established to separate 600 MHz downlink operations from 700 MHz uplink operations is too narrow, for example, the Commission would need to impose restrictive out-of-band-emission ("OOBE") limits or other performance constraints to avoid harmful interference. ¹² Absent the imposition of undesirable guard band or undesirable performance constraints (or both), the Down from 51 Reversed proposal could result in base-to-base and mobile-to-mobile interference between licensees in the 600 MHz and 700 MHz bands. ¹³ As a result, according to CTIA, "the

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⁶ Comments of Alcatel-Lucent, GN Docket No. 12-268 at 5 (June 14, 2013) ("Alcatel-Lucent Comments").

⁷ CTIA Comments at 9.

⁸ AT&T Comments at 3-4.

⁹ Verizon Comments at 4.

¹⁰ See CEA Comments at 4; Comments of Ericsson, GN Docket No. 12-268 at 6-7 (June 14, 2013) ("Ericsson Comments"); Mobile Future Comments at 5; Motorola Comments at 2; National Cable & Telecommunications Association Comments at 4-5; Qualcomm Comments at 12-13; Comments of Research in Motion, GN Docket No. 12-268 at 6 (June 14, 2013) ("RIM Comments"); Comments of Spectrum Management Consulting, GN Docket No. 12-268 at 2 (June 14, 2013) ("Spectrum Management Consulting Comments"); Comments of United States Cellular Corporation, GN Docket No. 12-268 at 17 (June 14, 2013) ("US Cellular Comments").

¹¹ See RIM Comments at 6; Spectrum Management Consulting Comments at 2.

¹² See, e.g., Spectrum Management Consulting Comments at 10; Ericsson Comments at 7.

¹³ See, e.g., RIM Comments at 6; Spectrum Management Consulting Comments at 2; CTIA Comments at 10; Ericsson Comments at 7.

frequencies adjacent to Channel 51 are much better suited for uplink spectrum, not downlink."14

Commenters also described how the Down from 51 Reversed approach creates inefficiencies at the lower edge of the band plan, adjacent to Channel 37. Because widely deployed user devices pose a greater threat of interference to wireless medical telemetry devices than wireless base stations do,¹⁵ the Reversed and TDD plans require a larger guard band near Channel 37 than does the traditional Down from 51 band plan.¹⁶

For these reasons, the Down from 51 Reversed proposal was not supported in the record. Accordingly, the Commission should not pursue a Down from 51 Reversed approach, but rather focus on a Down From 51 Plan, and in particular, the 35 x 35 MHz version of that plan that will deliver the greatest benefits for competition and consumers.

III. MANY COMMENTERS AGREED THAT TELEVISION CHANNELS CAN BE ACCOMMODATED BETWEEN UPLINK AND DOWNLINK ALLOCATIONS

More generally, the Down from 51 Reversed band plan on which the Commission sought comment appears to rest upon the assumption that intermodulation products from 600 MHz downlinks combining with television signals under the "Down from 51" band plan pose more than a theoretical risk of harmful interference to 600 MHz broadband licensees. However, the risk of harmful interference occurring as a result of intermodulation is, in fact, remote because the amplitude of the intermodulation products generated is not likely to be large enough to

¹⁴ CTIA Comments at 9.

¹⁵ Base stations, for example, may be strategically located at sufficient distances from medical telemetry device locations, whereas widely-deployed user devices would transmit in very close range to medical telemetry equipment.

¹⁶ See Ericsson Comments at 8; Comments of GE Healthcare, GN Docket No. 12-268 (June 14, 2013) ("GE Healthcare Comments"); RIM Comments at 6; WMTS Coalition Comments at 3.

overtake the desired received signal by the receiving equipment. The Down from 51 Reversed plan thus seeks to solve a problem that is not likely to occur in actual practice.

CCA and RIM agreed with T-Mobile that the presence of television in a portion of the uplink spectrum should not pose any special technical concerns. Although introducing broadcast channels in between uplink and downlink allocations could theoretically create intermodulation interference to mobile uplink transmissions with downlink transmissions combining with broadcast transmissions to create a new interfering signal, these concerns are unlikely to occur under real-world conditions. As CCA explained, "[i]ntermodulation concerns raised by commenters have no engineering or technical basis." The duplex filters in user equipment, among other things, would adequately attenuate any potential intermodulation interference.

Several other commenters, including Verizon, CTIA, Alcatel-Lucent, and Spectrum Management Consulting, stopped short of the conclusion embraced by T-Mobile, RIM, and CCA, but recognized that, at a minimum, the presence of television channels in a portion of the uplink of the Down from 51 plan in only a *minority* of markets should not create a serious interference problem and, in any case, should not be a reason to reject the Down from 51 plan.²¹ CTIA

¹⁷ See Comments of the Competitive Carriers Association, GN Docket No. 12-268 at 16 (June 14, 2013) ("CCA Comments"); RIM Comments at 8-9, 13-14.

¹⁸ See T-Mobile Comments at 5-6.

¹⁹ CCA Comments at 16.

²⁰ *Id.* at 16-17 (citing D. Hyslop and P. Kolodzy, *Lower 700 MHz Test Report: Laboratory and Field Testing of LTE Performance near Lower E Block and Channel 51 Broadcast Stations*, WT Docket No. 12-69 (Apr, 11, 2012); Reply Comments of V-Comm, L.L.C., prepared on behalf of Cavalier Wireless, Continuum 700, King Street Wireless, MetroPCS Communications, Inc., Vulcan Wireless LLC, WT Docket No. 12-69 (July 13, 2012).

²¹ See Alcatel-Lucent Comments at 4; CTIA Comments at 15; Spectrum Management Consulting Comments at 5; Verizon Comments at 7.

succinctly captured these commenters' position when it stated that "market variability can be handled by allowing *limited* use of the uplink . . . pass band for TV station operations."²²

A few commenters, however, suggested that television can *never* be between any portion of the uplink and downlink frequencies.²³ Much of this opposition appears to result from conflating the placement of broadcasters in the duplex gap with the placement of television in the uplink spectrum.²⁴ Failing to distinguish between television in the duplex gap as found in the original band plan²⁵ and television in the uplink as found in the Down from 51 plan clouds the record. Several commenters, for example, specifically cite to the general opposition to the Commission's original band plan, which allocates downlink entirely below Channel 37 and creates an exceptionally large duplex gap.²⁶

The following two graphics illustrate the important distinction between: (1) the presence of television in the uplink spectrum, and (2) the presence of television in the duplex gap between downlink and uplink frequencies:²⁷

²² CTIA Comments at 15 (emphasis added).

²³ See CEA Comments at 6-7; Motorola Comments at 4; NAB Comments at 9; US Cellular Comments at 11.

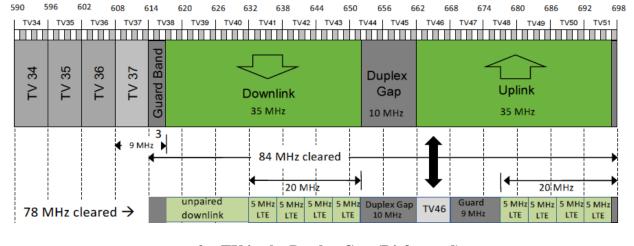
²⁴ See, e.g., CEA Comments at 6-7 (noting the considerable opposition to television in the *duplex gap* under the Commission's original proposed plan and arguing that television in the *duplex gap* above Channel 37 should be similarly opposed); Motorola Comments at 4 ("[A]llowing television stations within the *duplex gap* would require a much larger duplex gap than that which is technically reasonable to prevent interference to wireless handsets.") (emphasis added); NAB Comments at 9 ("The record makes crystal clear that high power TV operation[s] in the *duplex gap* is problematic for television viewers and wireless operations.") (emphasis added); US Cellular Comments at 11 ("[P]lacing high-power television broadcasters in the *duplex gap* would produce an elevated risk of intermodulation interference.") (emphasis added).

²⁵ See Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, Notice of Proposed Rulemaking, Docket No. 12-268, 27 FCC Rcd ¶ 126 (Oct. 2, 2012).

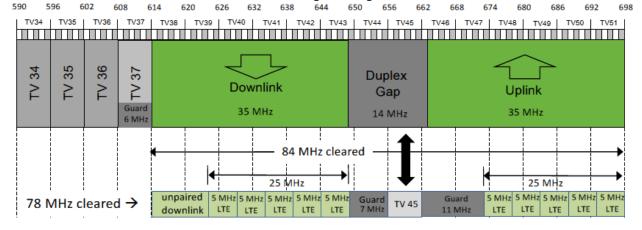
²⁶See, e.g., CEA Comments at 6-7; US Cellular Comments at 11.

²⁷ See T-Mobile Comments at 18-19.









To the extent commenters that vaguely reference television in or near the duplex gap raise a concern about needlessly expanding the size of the duplex gap and the cost such a decision would impose on carriers and equipment manufacturers as a result of antenna design inefficiencies, their concern is real and, in fact, one T-Mobile shares. To the extent these commenters maintain that accommodating unrelocated broadcast stations in portions of the uplink band of the Down from 51 plan poses an insurmountable problem, however, they are simply incorrect. While incorporating broadcasters anywhere above Channel 37 is undesirable because it renders idle otherwise valuable broadband spectrum, the situation does not pose an

interference threat grave enough to warrant reconsideration of the band plan design, especially so long as only a minority of markets are affected.

Once the ambiguity over terminology is dispelled, it appears that little actual opposition exists for placing television in channels in the uplink in a limited number of constrained markets. Intermodulation interference is unlikely to result under those conditions and, should it result, these conditions should not cause material harmful interference, especially if confined to a limited number of markets.

IV. WHILE A FEW PARTIES SUPPORTED A TDD APPROACH, TDD HAS SEVERAL DRAWBACKS COMPARED TO AN FDD PLAN

Although the majority of commenters supported a Down from 51 FDD approach, ²⁸ a few commenters touted the advantages of a TDD configuration. ²⁹ Clearwire, for instance, explained that it chose TDD technology for its 2.5 GHz spectrum holdings because of the flexibility TDD offers in adapting to uneven spectrum allocations across geographic markets. ³⁰ Sprint similarly indicated that a TDD plan "can be expanded seamlessly, flexibly accommodating the maximum amount of spectrum." ³¹ The proponents of TDD also highlighted TDD's ability to accommodate asymmetric downlink traffic, with C Spire asserting that TDD represents a better option for data-

²⁸ See AT&T Comments at 7; CEA Comments at 1; CTIA Comments at 6; GE Healthcare Comments at 6; Mobile Future Comments at 4; Motorola Comments at 1; National Cable & Telecommunications Association Comments at 8-9; Qualcomm Comments at 2; RIM Comments at 1; Spectrum Management Consulting Comments at 10; TIA Comments at 5; US Cellular Comments at 13; Verizon Comments at 2; Comments of CIT Group Inc., GN Docket No. 12-268 at 3 (June 14, 2013) ("CIT Group Comments").

²⁹ See C Spire Comments at 2; Sprint Comments at 2; Clearwire Comments; Comments of Sinclair Broadcast Group, Inc., GN Docket No. 12-268 at 1 (June 14, 2013).

³⁰ See Clearwire Comments at 4-5.

³¹ Sprint Comments at 11: see also Public Notice at 6.

centric networks.³² Despite these seeming benefits, however, a TDD plan presents several challenges that make it a less attractive alternative than an FDD approach.

First, although a Down from 51 TDD plan does not require any spectrum to be allocated to a duplex gap, ³³ a TDD band plan must relegate approximately 10 MHz of spectrum as a guard band to separate 600 MHz and 700 MHz operations. ³⁴

Second, unlike FDD, TDD requires a guard period to separate uplink and downlink operations and to compensate for different signal transit times between the base station and the mobile device. While FDD systems can continuously transmit information, the required TDD guard period is a loss of capacity that is not useful for licensed or unlicensed operations. As a result, a TDD network will require substantially more infrastructure and associated expense to achieve the same performance and coverage as an FDD network.

Additionally, guard periods have a more dramatic effect on efficiency and capacity when using lower-band spectrum. The favorable propagation characteristics at 600 MHz, which allow base stations to be separated farther apart, result in longer guard periods and leave fewer resources for actual data transmissions.

Third, a TDD plan requires synchronization between base stations to ensure that uplink and downlink transmissions occur at the same times to avoid severe interference between the two.

³² C Spire Comments at 3-4; *see also* Clearwire Comments at 4-5; Sprint Comments at 11.

³³ See Sprint Comments at 11; Clearwire Comments at 5.

³⁴ See, e.g., CEA Comments at 8-9; Qualcomm Comments at 16.

³⁵ See National Cable & Telecommunications Association Comments at 7-8.

³⁶ In TDD configurations, some sub-frame resources are reserved for the guard periods to enable switching between uplink and downlink operations. In FDD, by comparison, *all* sub-frame resources can be used for data transmissions. For a TDD system to achieve performance equivalent to an FDD system, TDD must compensate for the resources used for switching. This compensation can be achieved with increased effective coding rate (*i.e.*, less error correction which requires better signal), but this mechanism results in an inferior link budget. To overcome the inferior link budget and still deliver equivalent coverage and performance, a TDD will require many more sites than an FDD system.

Because uplink and downlink transmissions use the same frequency, the cells in a TDD network require inter-cell synchronization to a common time reference to align the switch points among all the cells. Synchronization is especially important in macro deployments with line-of-sight-like propagation conditions, which could result in severe interference in the uplink of victim base stations and between terminals. The favorable propagation characteristics of the 600 MHz band only makes synchronization more important – and more challenging.

Fourth, a TDD band plan would require the wireless industry to act in concert to not only synchronize their networks, but also to harmonize the uplink/downlink asymmetry. If the networks do not possess the same uplink/downlink ratio, they will interfere with one another. Achieving industry consensus on the appropriate uplink/downlink ratios (i.e., the appropriate length for uplink and downlink time slots) could prove extremely challenging and would likely require time-consuming Commission intervention or mediation regarding what is, at bottom, a business decision that rests on system performance, target market, population density, and other considerations.³⁷ Moreover, once set, the uplink/downlink ratio may prove difficult to alter even if failing to change the ratio prevents some operators from introducing innovative new services or satisfying consumer demand for different types of traffic patterns.

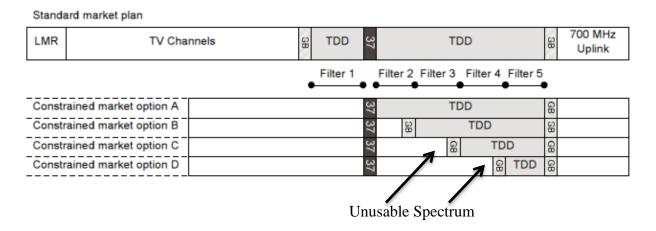
Fifth and finally, although the TDD band plan could theoretically expand and contract precisely based on the amount of spectrum cleared in each market, ³⁸ limitations in TDD filters substantially reduce this potential flexibility. In spectrum-constrained markets, a broadcast channel could fall within the passband of the TDD RF filter, thus precluding the use of any

³⁷ See, e.g., AT&T Comments at 10.

³⁸ See Public Notice at 6.

spectrum blocks relying on that filter. For example, in the Commission's depiction of the TDD band plan, TDD blocks are apparently not introduced except in 20 MHz increments:

Market Variation in Down from 51 TDD, more than 84 MHz cleared



As shown in the diagram, introducing an additional TDD channel in Constrained Market Options C and D would result in unusable spectrum because broadcast operations could fall within Filters 3 and 4. While mechanisms exist to mitigate the potential for interference, those measures will involve tradeoffs in performance, speed, or capacity. For example, were the band plan to introduce an individual filter for each 10 MHz TDD block, carriers would be unable to take advantage of wideband efficiencies possible through aggregation of multiple TDD blocks.³⁹ This broadcast-in-the-passband problem is only exacerbated if the filters are further optimized for wider-band deployments, as would be the case with 30 MHz filters.⁴⁰

While a TDD band plan involves these significant challenges, a TDD approach may merit consideration under the right circumstances. For instance, for unpaired spectrum recovered

³⁹ Interoperability problems could also arise under the TDD approach as a result of these filter limitations. Absent a robust interoperability requirement, different operators could deploy and use different, block-specific TDD device configurations, which would raise switching costs and frustrate consumer choice. *See*, *e.g.*, Ericsson Comments at 10 (noting that band plan should have overlapping filters to avoid interoperability issues).

⁴⁰ Current technology already offers the ability to accommodate TDD filters of nearly 50 MHz (or roughly 7.5% of the pass band center frequency of approximately 656 MHz). As the technology continues to evolve, this tradeoff between wideband efficiencies and concerns presented by broadcaster interference will only become more stark.

below Channel 37, a flexible use (allowing TDD or supplemental downlink) allocation could offer greater value than a supplemental downlink-only allocation. Whereas paired 5x5 MHz LTE blocks may be more valuable and easier to configure for spectrum above Channel 37, providing for flexible use of the spectrum below Channel 37 might enable better and more efficient use than limiting it to only supplemental downlink. Nevertheless, for the 600 MHz spectrum that wireless broadband operators can most readily pair – the spectrum above Channel 37 – T-Mobile's Down from 51 plan uses spectrum more efficiently to meet consumers' exploding data demands and poses fewer deployment challenges than a TDD approach.

V. ALTHOUGH CO-CHANNEL INTERFERENCE MAY PRESENT A CHALLENGE, IT SHOULD BE MANAGEABLE

Introducing market-by-market variability creates the risk that high-power broadcast transmissions will overwhelm lower-power mobile handset uplink transmissions when the two operate on the same frequency in geographically adjacent markets. Some degree of market variation in the 600 MHz band is inevitable because the incentive auction relies upon broadcasters voluntary participation. As a result, every 600 MHz wireless band plan proposal must address levels of spectrum clearing that will vary depending on the willingness of broadcasters in that market to sell and the ability to relocate those who do not sell to other low-frequency blocks of spectrum. Managing co-channel interference under these conditions will require some measure of geographic separation between wireless base stations and broadcast

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⁴¹ See US Cellular Comments at 13 (advocating for a "Down from 51 Hybrid Plan," which would allow for flexible use spectrum in higher-clearing markets).

⁴² See, e.g., T-Mobile Comments at 17 n.32; see also Verizon Comments at 2-3. This concern is not unique to a Down from 51 plan that accommodates broadcast television in between uplink and downlink allocations – the Down from 51 Reversed plan and the Down from 51 TDD plan also provide for uplink transmissions on the same channel as broadcast operations in a neighboring market.

towers; however, the precise amount of geographic separation will vary with topology, morphology, and system design.⁴³

With several different variables relevant to the necessary degree of geographic separation, across-the-board predictions of minimum separation distances necessary to avoid co-channel interference between broadcast and broadband operations are likely to prove incorrect. While 200 kilometers may represent an entirely proper separation distance for some areas, ⁴⁴ that distance may be too great in some areas and too small in others. ⁴⁵ Additional analysis can provide insight into the precise amount of separation needed, as much of the work in this area remains in preliminary stages. ⁴⁶

Whatever the precise separation distance in each scenario may be, this co-channel interference concern appears manageable. Verizon, for example, has indicated that it will likely be possible to accommodate geographic variation in a small number of markets. Similarly, AT&T suggests that although the issue may "demand much effort and ingenuity," the company remains committed to finding a solution to this challenge. Even if separation distances of 200 kilometers are required in some instances, therefore, many television operations will benefit from substantially better attenuation than these larger predicted separation distances suggest. The Commission's band plan design should rest not upon the least common, worst-case scenarios,

⁴³ See, e.g., Verizon Comments at 7.

⁴⁴ See, e.g., AT&T Comments at 5; Qualcomm Comments at 14.

⁴⁵ See, e.g., Verizon Comments at 8 (noting that barriers, such as topography, can mitigate interference).

⁴⁶ See, e.g., AT&T Comments at 7 (noting that it has only conducted a limited preliminary analysis); Verizon Comments at 8 (noting that Verizon continues to evaluate the issue).

⁴⁷ Verizon comments at 8.

⁴⁸ AT&T Comments at 7.

⁴⁹ See T-Mobile Comments at 17 n.32; Roberson & Associates, LLC, Technical Analysis of the 35x35 MHz Band Plan, attached to Ex Parte Presentation of T-Mobile USA, Inc., GN Docket No. 12-268 (Apr. 17, 2013).

but rather upon the large subset of relatively confined co-channel interference scenarios found at most stations in most types of terrain.

VI. A CONTINGENT BAND PLAN OFFERS SIGNIFICANT FLEXIBILITY

A contingent band plan offers substantial flexibility for adopting a band plan that is optimized for a higher-clearing scenario if fewer broadcasters decide to exit the market than is expected. While T-Mobile remains optimistic about the level of broadcast clearing that can be achieved, ⁵⁰ a backup, or contingent, plan for lower clearing scenarios offers a hedge if the reverse auction results are disappointing.

Other commenters recognized the advantages of this approach.⁵¹ Verizon, for example, continued to call for a 35x35 MHz band plan if 84 MHz of spectrum clears in most markets nationwide, while providing for another plan, with less paired spectrum, if less spectrum clears.⁵² As Verizon explained, the advantage of a contingent plan is that the optimal plan depends on how much spectrum clears.⁵³ If 84 MHz clears in most markets, then a 35x35 MHz plan is optimal because the benefits of maximizing paired spectrum likely outweighs the challenges of

⁵⁰ In its original round of comments, T-Mobile cited to a preliminary study that Intel had conducted regarding how many broadcasters occupied channels above Channel 37. T-Mobile Comments at 12-13 (citing Reply Comments of Intel Corporation, GN Docket No. 12-268 (Mar. 12, 2013). T-Mobile explained that "the results of Intel's analysis, preliminary and somewhat over-simplified as they may be, are directionally very positive and provide a basis for optimism going into the auction." T-Mobile Comments at 13. Since T-Mobile filed these comments, the National Association of Broadcasters ("NAB") has filed a letter asserting that Intel's preliminary analysis is flawed. See Ex Parte Letter from Rick Kaplan, Executive Vice President, Strategic Planning, National Association of Broadcasters, to Gary Epstein, Incentive Auction Task Force Chair, Ruth Milkman, Chief, Wireless Telecommunications Bureau, and William Lake, Chief, Media Bureau, GN Docket No. 12-268 (June 20, 2013). In the course of discussing the Intel study, NAB does provide useful figures about the number of stations above Channel 37 in the top 25 DMAs – 19 of the 25 top DMAs have 8 or fewer stations (out of a possible 14) located above Channel 37. See id. at 3. Although there is not the level of vacancy suggested by the Intel study, these figures helpfully reveal that many broadcast channels above Channel 37 are unoccupied. T-Mobile thus joins Verizon in calling for the Commission to release its repacking framework so that the agency and commenters can develop a more complete picture of the clearing challenges faced in the incentive auction – especially before the Commission decides to settle for a second best band plan. See Verizon Comments at 11.

⁵¹ See Verizon Comments at 7; CCA Comments at 14.

⁵² Verizon Comments at 7.

⁵³ See id.

mitigating interference in a limited number of markets.⁵⁴ But if less than 84 MHz clears in a sizeable number of markets, a smaller pairing is optimal. CCA similarly recognized that the band plan should be optimized based on the amount of spectrum cleared.⁵⁵

In adopting a contingent band plan, however, the Commission should avoid varying the band plan by region. Rather, the band plan, whether optimized for a higher- or lower- clearing scenario, should apply on a nationwide basis. In its comments, Verizon introduced the idea of varying the band plan by large geographic region (i.e., a 25x25 MHz band plan in lower-clearing geographic regions and a 35x35 MHz band plan in higher-clearing regions). While a creative idea for accommodating market variation, regional variations in the band plan would risk diminished scale economies and could create new interoperability challenges similar to those found in the 700 MHz band.

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⁵⁴ *See id.* at 8.

⁵⁵ CCA Comments at 14.

⁵⁶ Verizon Comments at 9-10.

VII. CONCLUSION

By issuing the *Public Notice*, the Commission has confirmed that the majority of commenters support some type of Down from 51 FDD band plan.⁵⁷ Although many commenters do not identify the exact contours of the Down from 51 FDD plan that they support,⁵⁸ T-Mobile and several other commenters agree that a 35x35 MHz band plan offers the best prospects for consumers to benefit from the incentive auction.⁵⁹ By maximizing the amount of paired spectrum available at auction while carefully accommodating market-by-market variability, T-Mobile's 35x35 MHz band plan will help encourage robust competition in the wireless market for years to come.

Respectfully submitted,

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⁵⁷ See AT&T Comments at 7; CEA Comments at 1; CTIA Comments at 6; GE Healthcare Comments at 6; Mobile Future Comments at 4; Motorola Comments at 1; National Cable & Telecommunications Association Comments at 8-9; Qualcomm Comments at 2; RIM Comments at 1; Spectrum Management Consulting Comments at 10; TIA Comments at 5; US Cellular Comments at 13; Verizon Comments at 2; CIT Group Comments at 3.

⁵⁸ See, e.g., CTIA Comments at 6, CEA Comments at 1, Mobile Future Comments at 4, Motorola Comments at 1, TIA Comments at 5, US Cellular Comments at 13, National Cable & Telecommunications Association Comments at 8-9, GE Healthcare Comments at 6, Spectrum Management Consulting Comments at 10; CIT Group Comments at 3.

⁵⁹ See T-Mobile Comments at 2; Research in Motion Comments at 13-14; Verizon Comments at 4.